ACCESSION #: 9607080337

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Sequoyah Nuclear Plant (SQN), Unit 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000327

TITLE: Turbine and Reactor Trips Resulting From a Failure of the

'A' Phase Main Transformer Sudden Pressure Relay

EVENT DATE: 07/17/95 LER #: 95-010-01 REPORT DATE: 07/03/96

OTHER FACILITIES INVOLVED: NA DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J. Bajraszewski, Compliance TELEPHONE: (423) 843-7749

Licensing Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: FK COMPONENT: RLY MANUFACTURER: Q011

REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

This LER is being revised to provide root cause failure analysis information. On July 17, 1995, with Unit 1 in power operation at approximately 100 percent, a turbine trip occurred followed by a reactor trip. The event resulted from the initiation of a trip signal by a sudden pressure rely located on the 'A' phase main transformer. A review of the condition determined that a no fault condition existed in the transformer. The reactor protection systems responded to the trip as expected; no anomalies occurred. Operators responded to the trip as prescribed by procedures and stabilized the reactor in the hot

standby condition. Subsequent to the event, the sudden pressure relay, Qualitrol Corporation Model No. 900-003-01, was tested and found to be defective. Testing was performed on two additional Qualitrol Series 900 sudden pressure relays. Those relays were found to be nonfunctional. After an examination of the internal components of the failed relays, it was determined that the nonorificed control bellows was distended in each of the relay assemblies. Subsequent to the event, Qualitrol Series 900 sudden pressure relays that are located on transformers in use were either disabled or replaced with relays of a different design. Root cause failure analysis determined that the bellows is being deformed when the sudden pressure relay is isolated and heated. The heat source could be solar, transformer operation, or the oil purification process. Lessons learned have been provided to the appropriate personnel. New Qualitrol relays are being installed and placed in service.

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I. PLANT CONDITIONS

Unit 1 was in power operation at approximately 100 percent.

II. DESCRIPTION OF EVENT

A. Event

On July 17, 1995, at 1314 eastern daylight time (EDT), a turbine trip occurred followed by a reactor trip. The event resulted from the initiation of a trip signal by a sudden pressure relay (EIIS Code RLY) located on the 'A' phase main transformer (EIIS Code FK). A review of the condition determined that a no fault condition existed in the transformer. The reactor protection systems responded as expected to the trip; no anomalies occurred. Operators responded to the trip as prescribed by procedures and stabilized the reactor in the hot standby condition.

B. Inoperable Structures, Components, or Systems that Contributed

to the Event

None.

C. Dates and Approximate Times of Major Occurrences

July 17, 1995 The turbine tripped followed by a reactor trip.

at 1314 EDT The trip signal was initiated by the 'A' phase

main transformer sudden pressure relay.

July 17, 1995 The main control room operators stabilized the

Approximately reactor in a safe condition, Mode 3 (hot

1405 EDT standby).

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

The turbine and reactor trips were annunciated on the main

control room panels.

F. Operator Actions

Control room operators responded as prescribed by emergency

procedures. The condition was promptly diagnosed, and the

necessary actions were taken to stabilize and maintain the unit

in a safe condition.

G. Safety System Responses

The plant responded to the turbine and reactor trips as

designed.

III. CAUSE OF EVENT

A. Immediate Cause

The immediate cause of the event was the initiation of a trip signal by the 'A' phase main transformer protection circuit. An evaluation of the condition determined that the trip signal was initiated by the sudden pressure relay located on the 'A' phase main transformer.

B. Root Cause

The root cause of the event was the failure of the sudden pressure relay located on the 'A' phase main transformer. Subsequent disassembly of the relay determined that the nonorificed bellows was distended. Root cause failure analysis determined that the bellows is being deformed when the sudden pressure relay is isolated and heated. Heat added to the closed system results in bellows expansion with the increase of pressure that is associated with the temperature rise. The pressure increase is dependent on the temperature of the relay at the time of isolation, the type of isolation valve used (butterfly valve closure induces a higher preload pressure on the relay than a gate valve), and the amount of heat added. Testing has shown that solar, transformer operation, or oil purification process heating could cause bellows deformation and relay failure when the relay is isolated. As part of the

root cause analysis, a TVA-wide inspection was performed of the bellows on Qualitrol sudden pressure relays installed on transformers at hydro, fossil, and nuclear plants. The TVA-wide inspection did not identify any other failed relays inservice, other than the three failed relays identified in this LER.

C. Contributing Factors

None.

IV. ANALYSIS OF EVENT

The plant response during and after the unit trip was consistent with the responses described in the Final Safety Analysis Report, and accordingly, the event did not adversely affect the health and safety of plant personnel or the general public.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

Control room operators responded as prescribed by emergency procedures. The condition was promptly diagnosed, and the necessary actions were taken to stabilize and maintain the unit in a safe condition.

B. Corrective Actions to Prevent Recurrence

Subsequent to the event, Qualitrol Series 900 sudden pressure relays located on the main bank transformers were disabled.

Qualitrol Series 900 sudden pressure relays located on other transformers that are in use were either disabled or replaced with a sudden pressure relay of a different design. Following the completion of a failure analysis, lessons learned have been provided to the appropriate personnel.

VI. ADDITIONAL INFORMATION

A. Failed Components

The failed component for this event was a sudden pressure relay, Model No. 900-03-01 (rapid pressure rise relay), manufactured by Qualitrol Corporation.

A trip signal was initiated by the sudden pressure relay located on the 'A' phase main transformer. Subsequent to the event, the sudden pressure relay, Qualitrol Corporation Model No. 900-003-01, was tested and found to be defective. Testing was performed on two additional Qualitrol Series 900 sudden pressure relays. Those relays were found to be nonfunctional. After an examination of the internal components of the failed relays, it was determined that the nonorificed control bellows was distended in each of the relay assemblies. Subsequent to the event, Qualitrol Series 900 sudden pressure relays were disabled or replaced with relays of a different design.

B. Previous Similar Events

A review of previous events identified two other events (50-327/86026 and 90022) associated with the failure of the sudden pressure relay. Those failures resulted from either a shorted micro-switch or wiring terminal. Actions taken for those failures would not have prevented the event described by this LER.

C. Additional Information

The existing Qualitrol sudden pressure relays at SQN are being replaced with new Qualitrol sudden pressure relays and returned to service. The relay isolation valves are being labeled to indicate that the valves are to remain open, except for relay replacement. For positive control of the relay isolation valves, the valve operators (handwheels) have been removed from the valves. This will prevent inadvertent operation of the isolation valves. These conservative efforts are being undertaken to ensure equipment reliability and to use the protection features provided by the relays.

VII. COMMITMENTS

None.

Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379-2000

R.J. Adney

Site Vice President

Sequoyah Nuclear Plant

July 3, 1996

U.S. Nuclear Regulatory Commission

ATTN: Document Control Desk

Washington, D.C. 20555

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT (SQN) UNIT 1 - DOCKET

NO. 50-327 - FACILITY OPERATING LICENSE DPR-77 LICENSEE EVENT REPORT

(LER) 50-327/95010, REVISION 1

The subject LER is being revised to provide root cause failure analysis

information. This report was originally submitted in accordance with 10

CFR 50.73 (a)(2)(iv) as an event that resulted in the automatic actuation

of engineered safety features, including the reactor protection system.

Revisions to the LER are identified by vertical bars in the right-hand

margin.

Sincerely,

R. J. Adney

Enclosure

cc: See page 2

U.S. Nuclear Regulatory Commission

July 3, 1996

Enclosure

cc (Enclosure):

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